

X-38 TPS SEAL STATUS

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X -38 TPS Seal Status

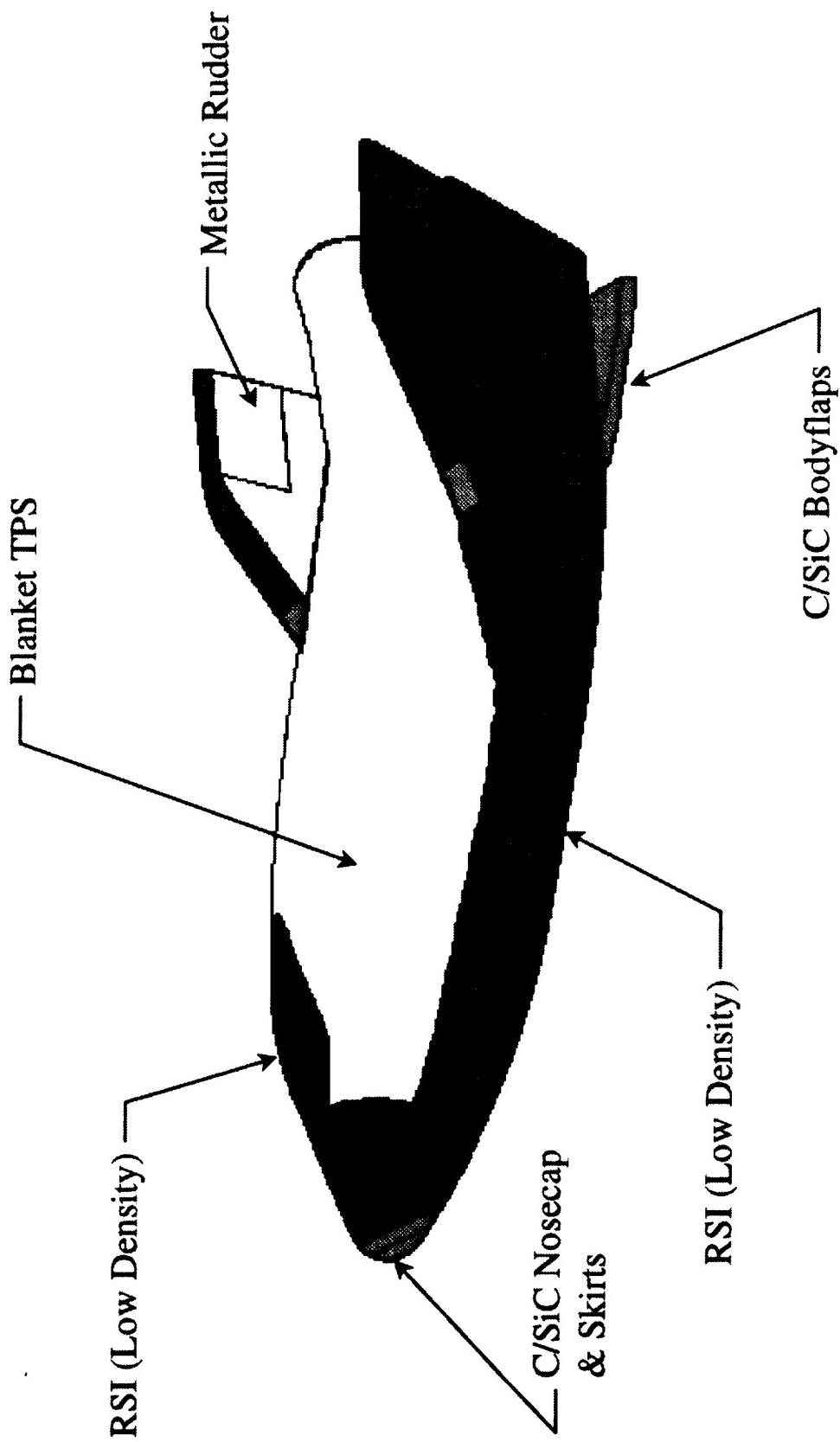
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NASA Glenn Research Center
October 28-29, 1999

X38 - Crew Return Vehicle

- An element of the International Space Station (ISS)
- Three Scenarios
 - ISS catastrophe
 - Emergency medical evacuation
 - Period of Space Shuttle unavailability
- X-38 Program Purpose:
 - To greatly reduce the costs and schedule for the development of Crew Return Vehicles (CRV's) and Crew Transfer Vehicles (CTV's) through the use of the rapid development methodology associated with an X-project
 - Ground Testing
 - Atmospheric Testing
 - Space Flight Testing

X-38 TPS Configuration



X38 - TPS Seals

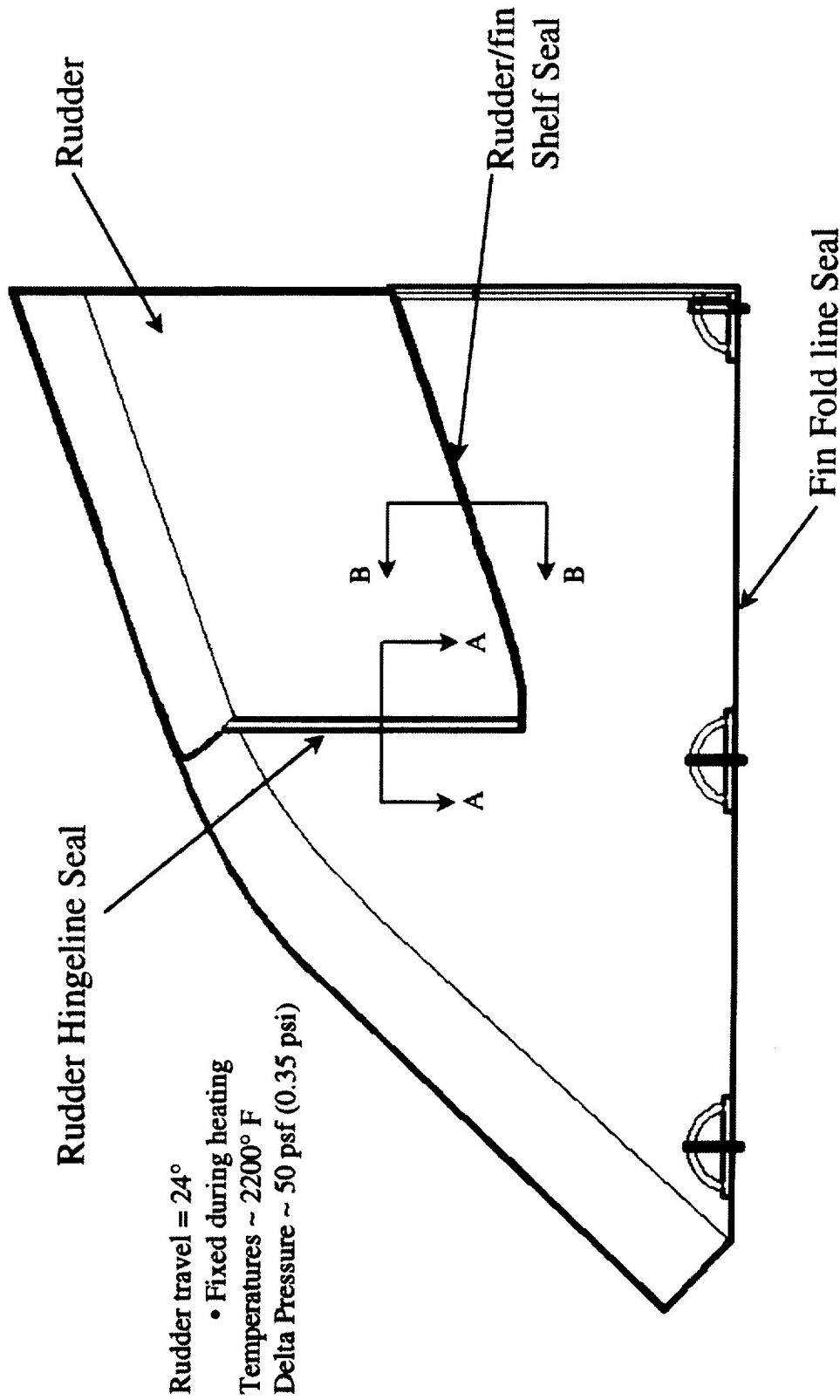
General Seal Requirements

- 1) Single Flight Capability
- 2) High Temperature, Oxidative Environment
- 3) Combined Convective and Radiation Heating
- 4) Different Thermal Expansion of Seal Parts
- 5) Mechanical Load Plus Vibration/acoustic Loads
- 6) Component Movement and Rotation
- 7) Wear Resistant
- 8) Low Pressure Environment (at Peak Heating)
- 9) Low Permeability to Minimize Leakage

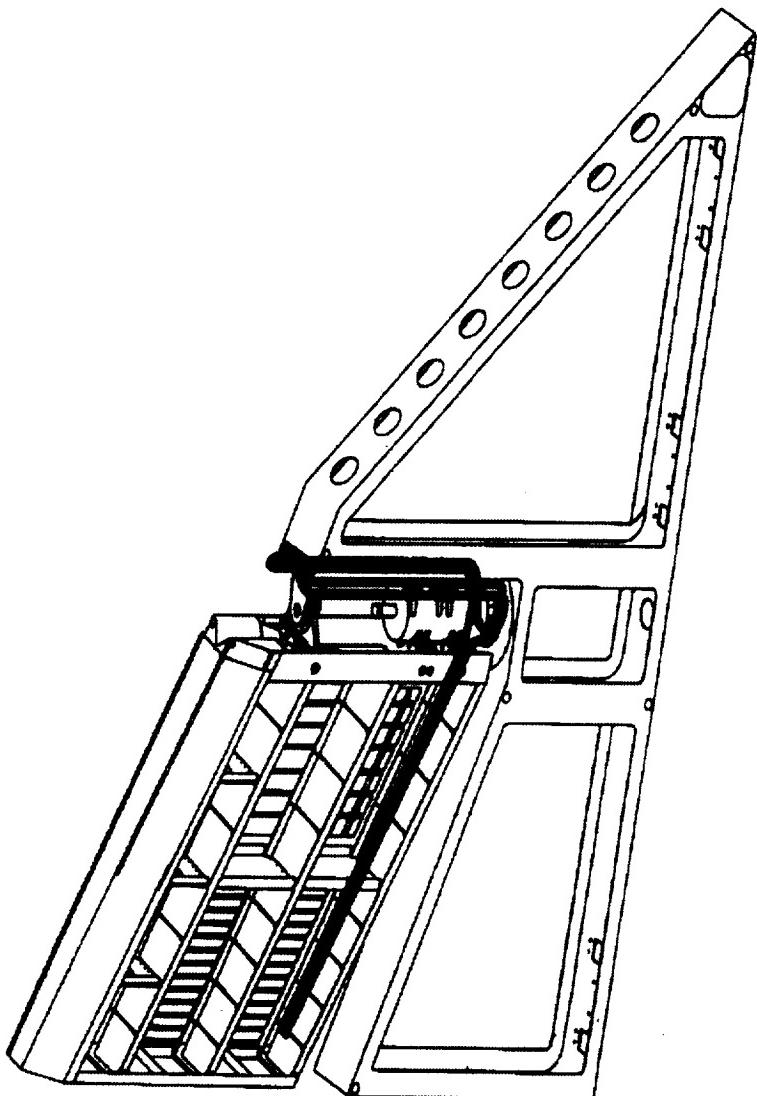
Specific X-38 Design Considerations

- 1) Use a Seal With Flight Heritage (Orbiter)
- 2) Operational Temperature - 1500 - 3000°F
- 3) Permeability - $1 \times 10^{-10} - 1 \times 10^{-11}$ Sq. M
- 4) Coefficient of Friction - 1.09 - 1.17
- 5) Installation Force Limit of 3 LB/in (Installed With 20-30% Seal Deflection)
- 6) Differential Pressures of 350 - 450 PSF During Peak Heating

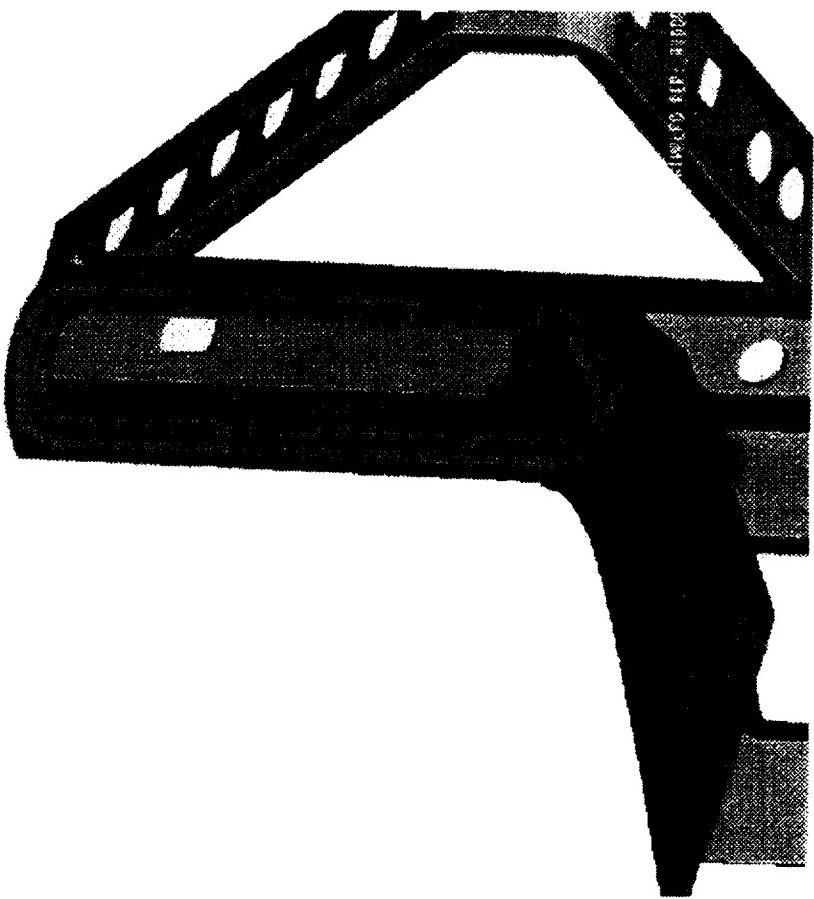
Fin & Rudder Seals



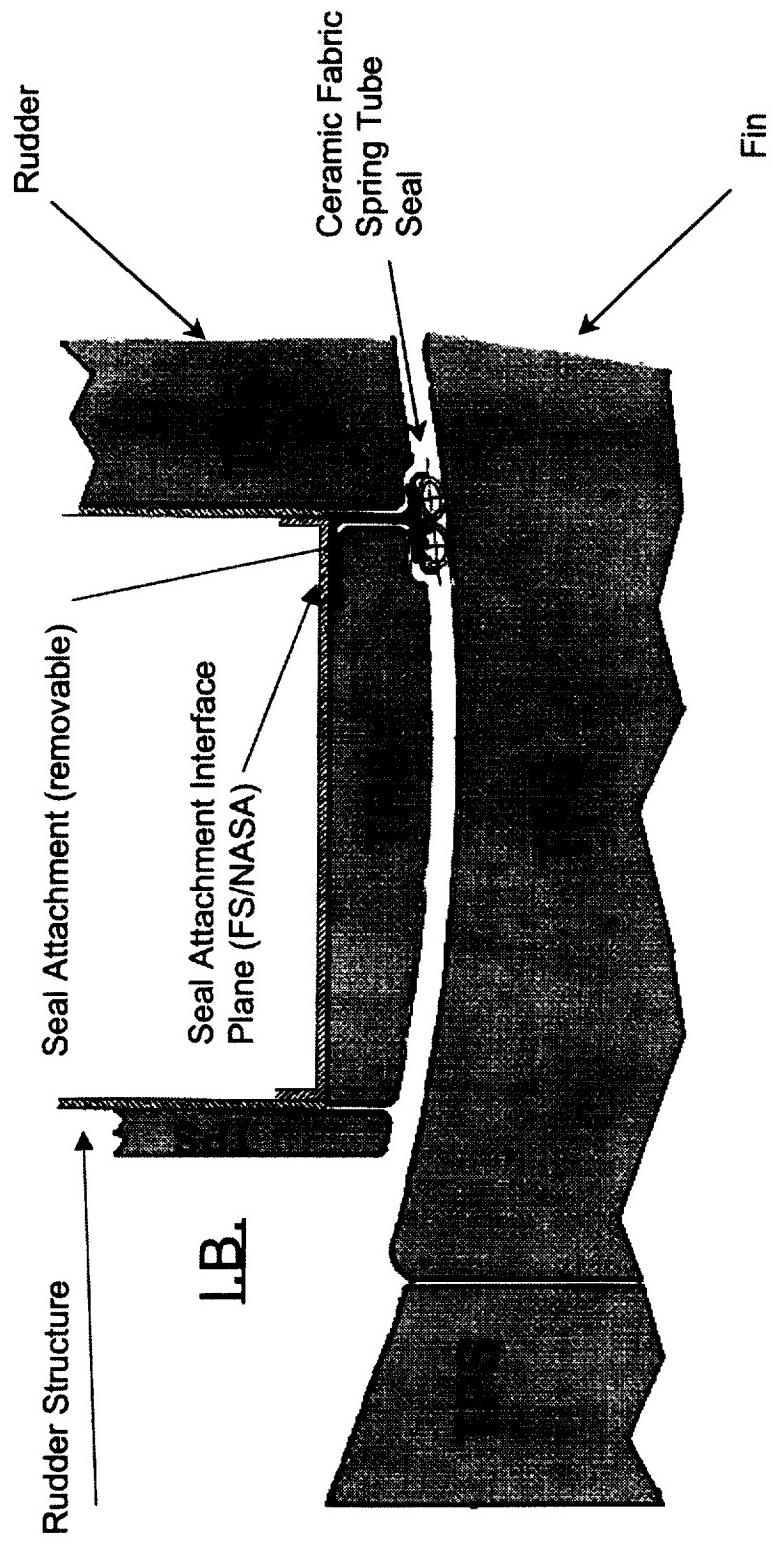
Rudder - Fin Structure Seal Routing



Fin/Rudder Seal



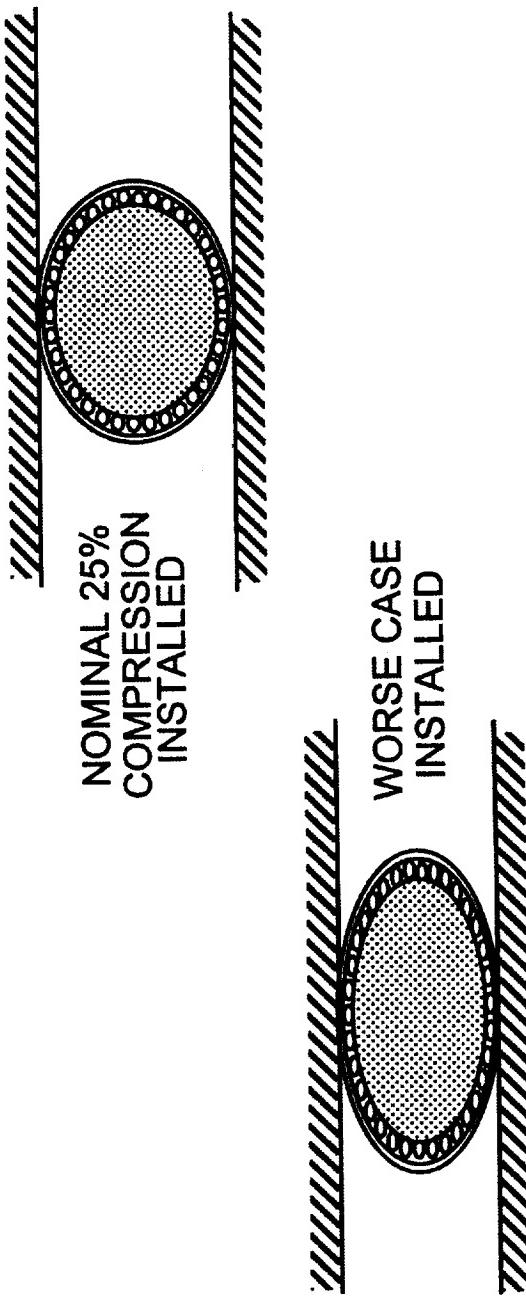
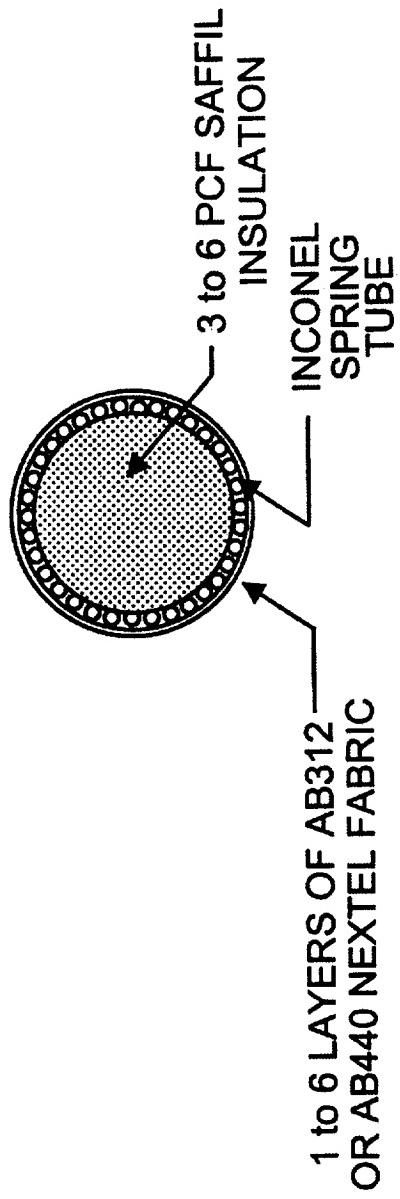
Rudder/Fin Shelf Seal



Section B-B

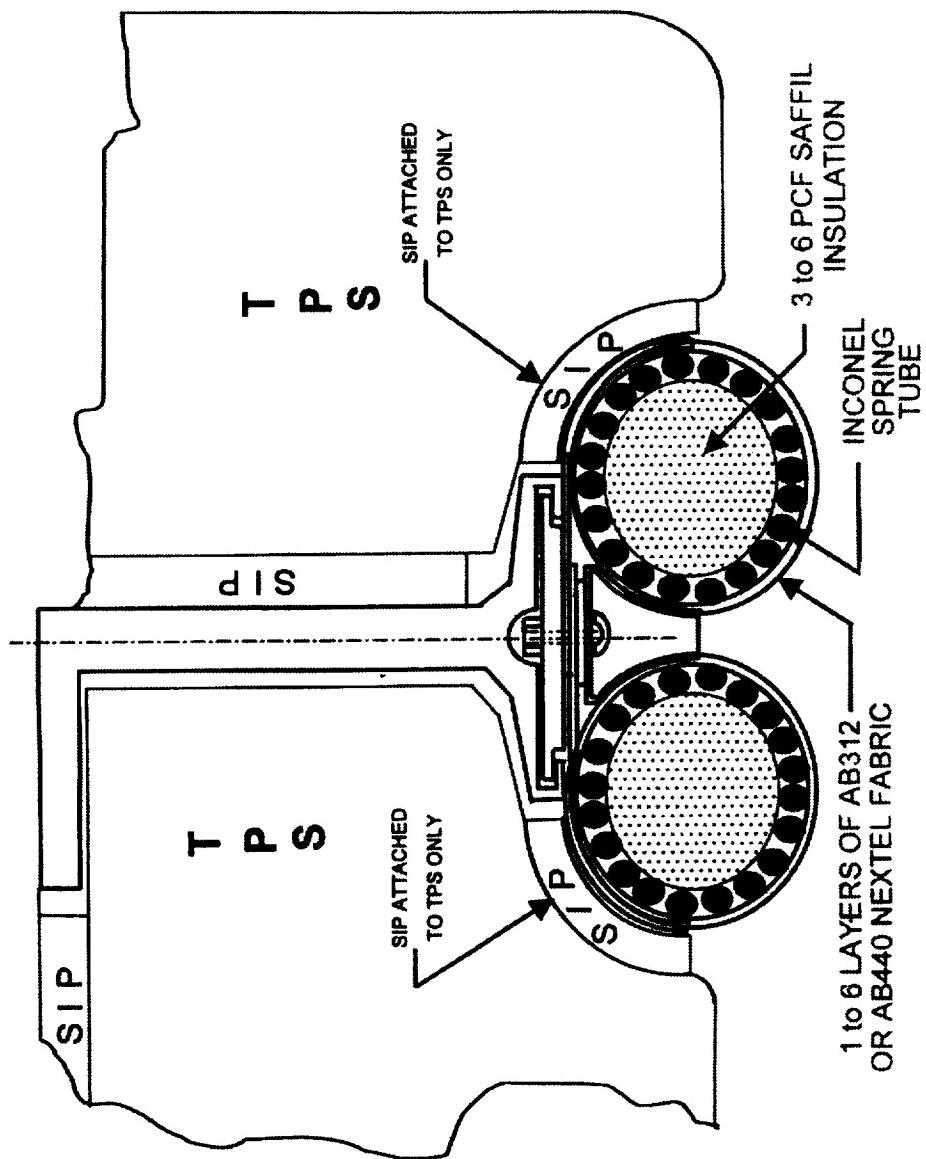
X-38 TYPICAL SPRING TUBE SEAL

AS FABRICATED

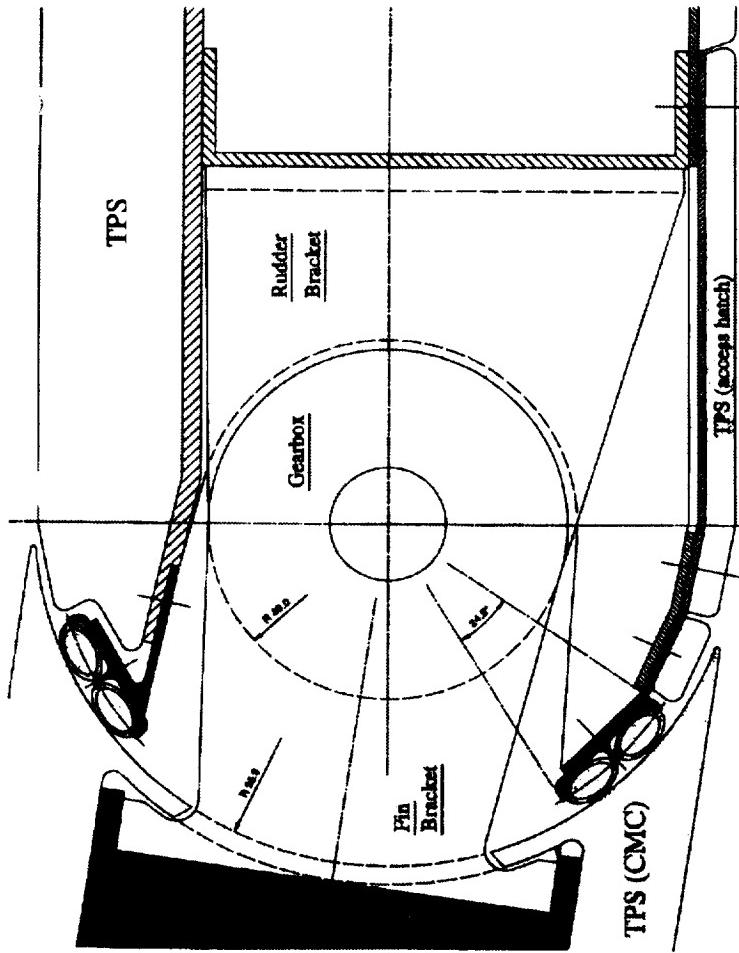


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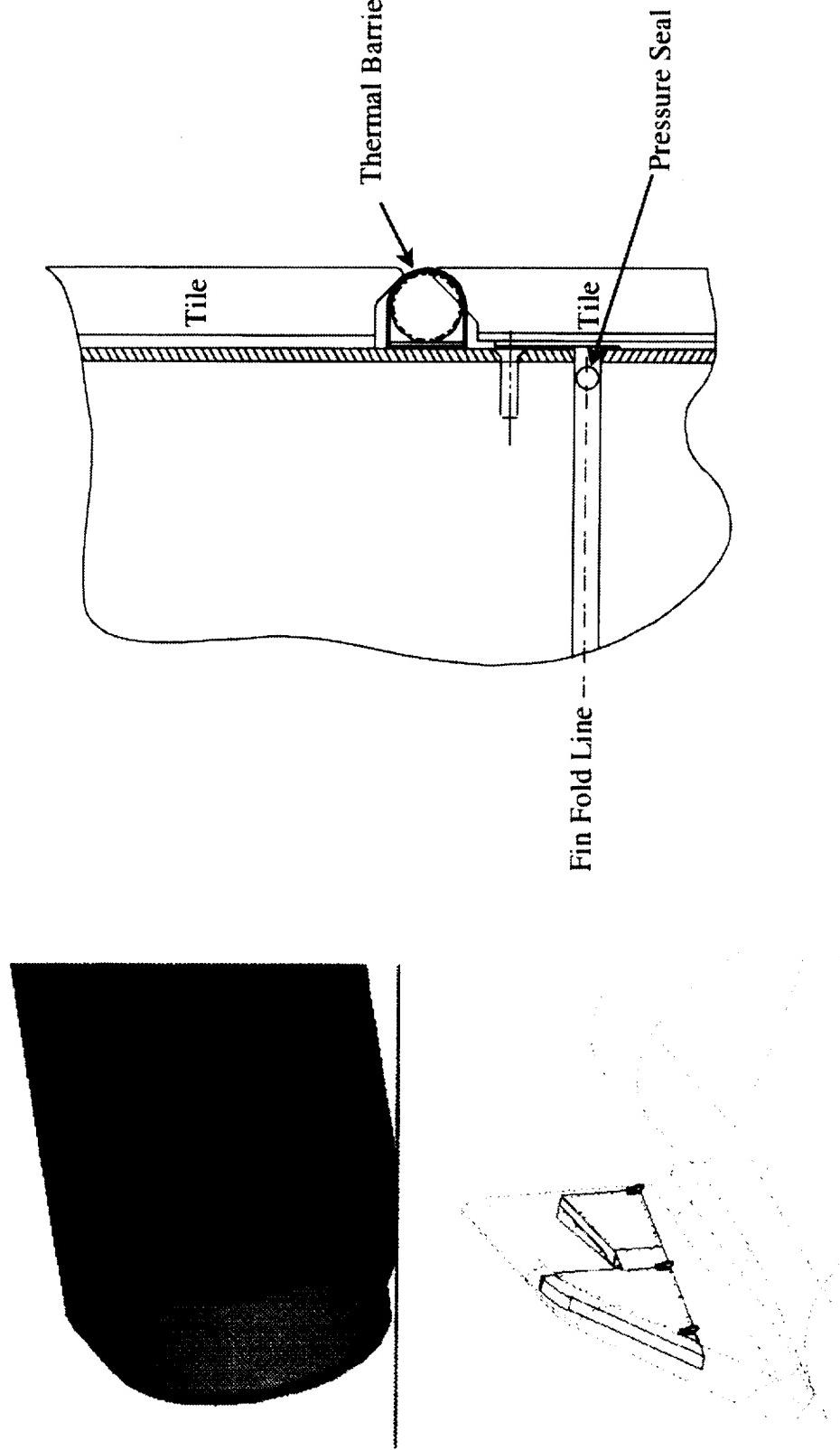


Rudder Hingeline Seal

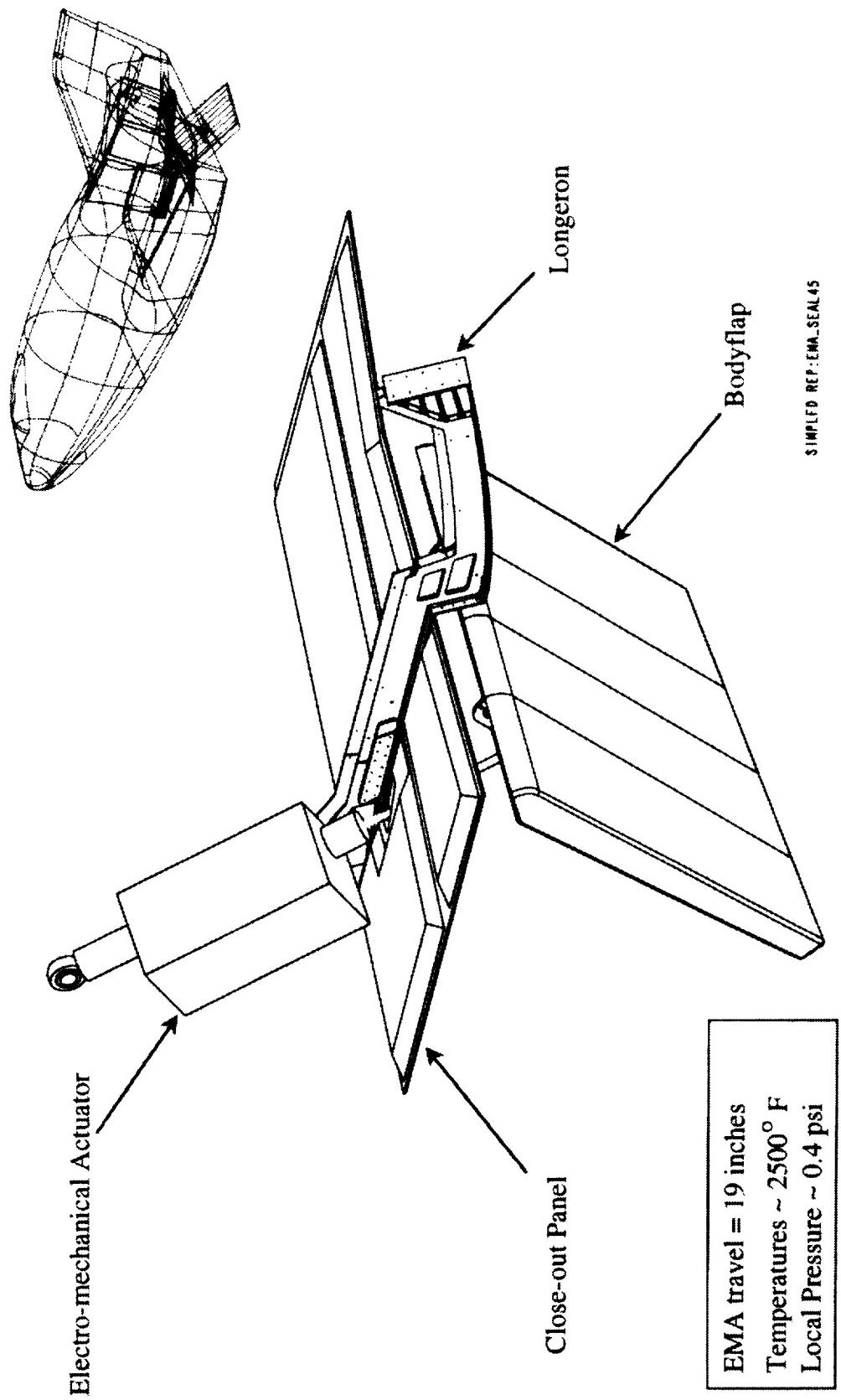


Section A-A

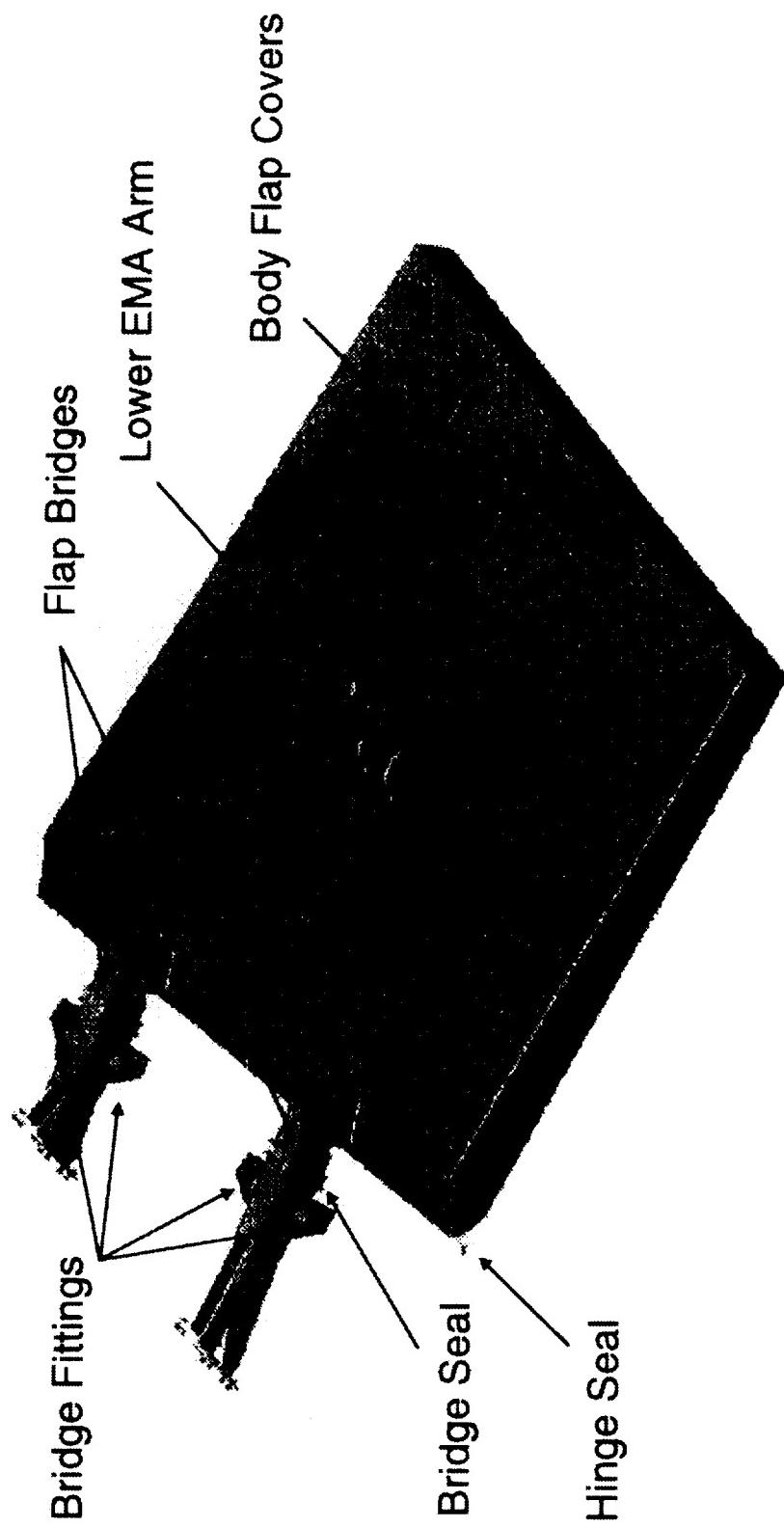
Folding Fin



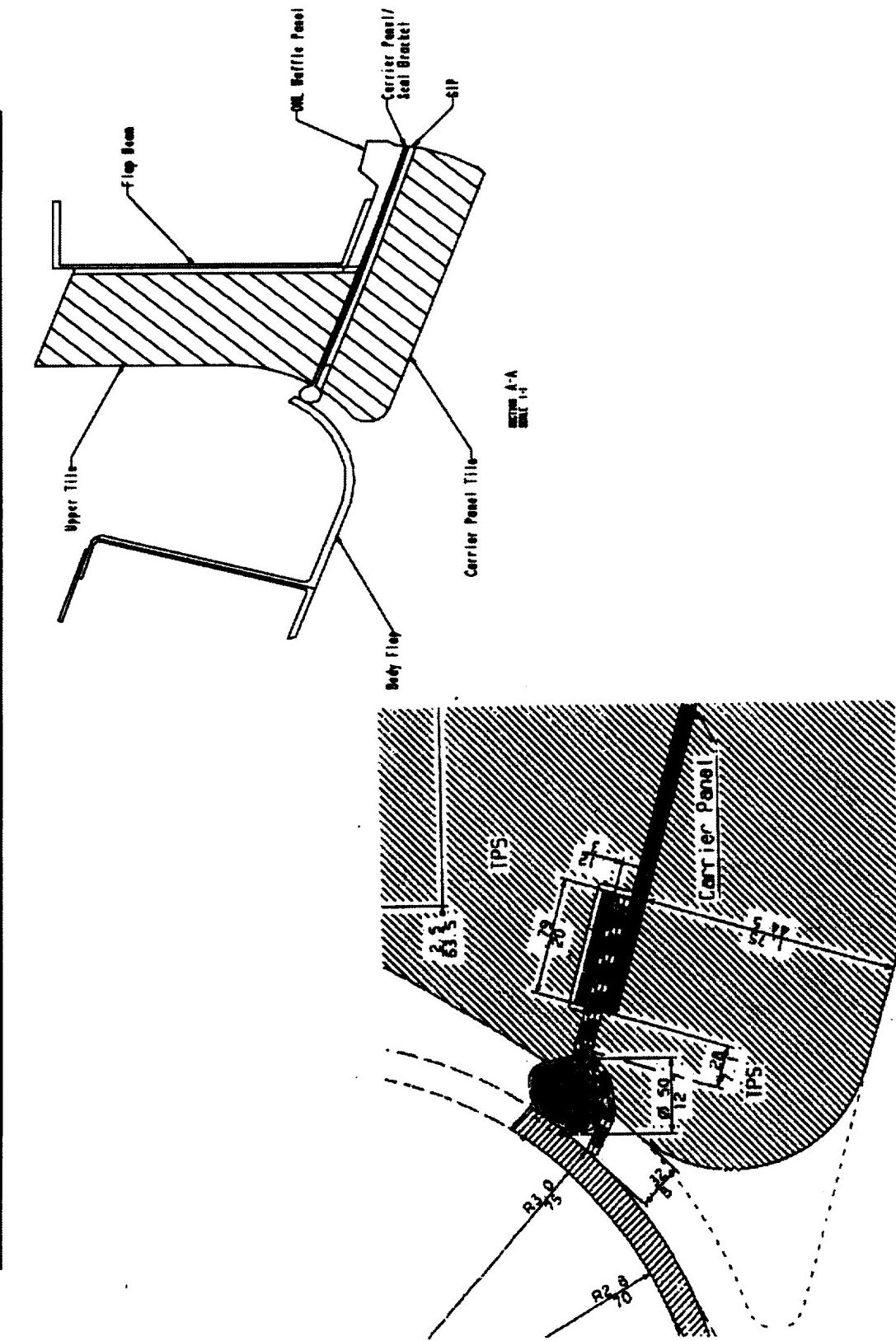
Bodyflap Configuration



X - 38 Bodyflap

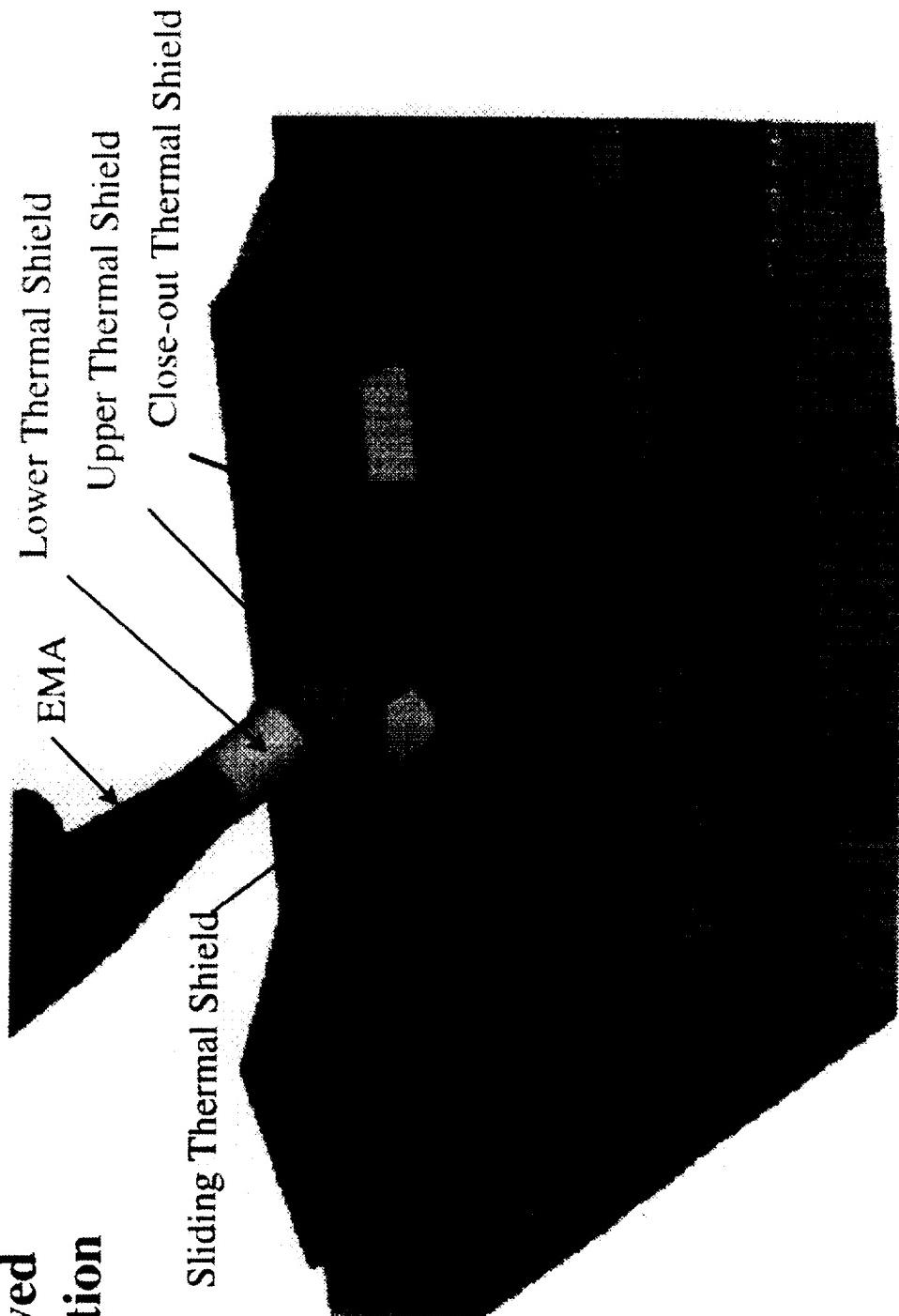


Body Flap Hinge Line Seal



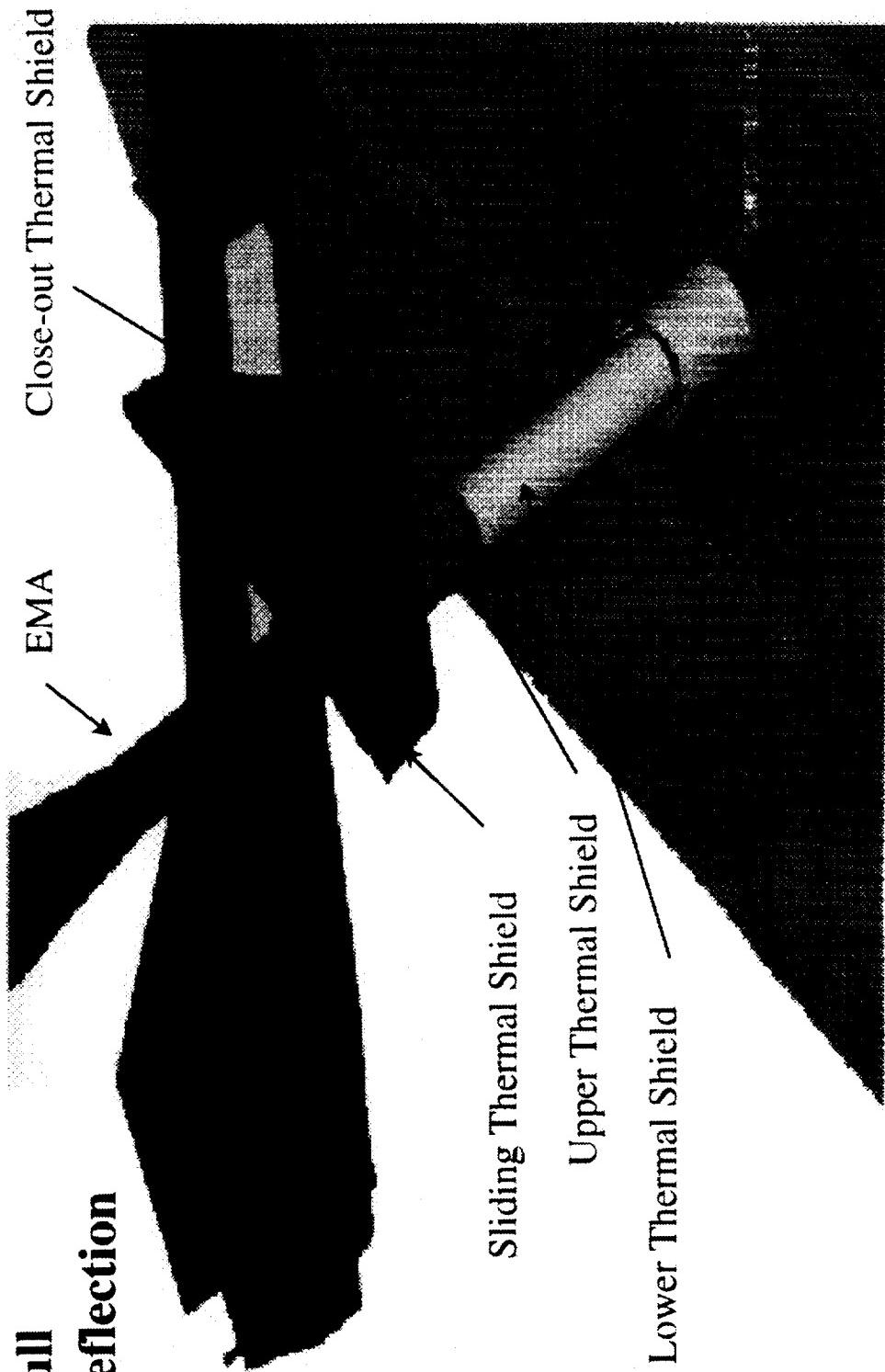
Bodyflap - Undeflected

**Stowed
Position**



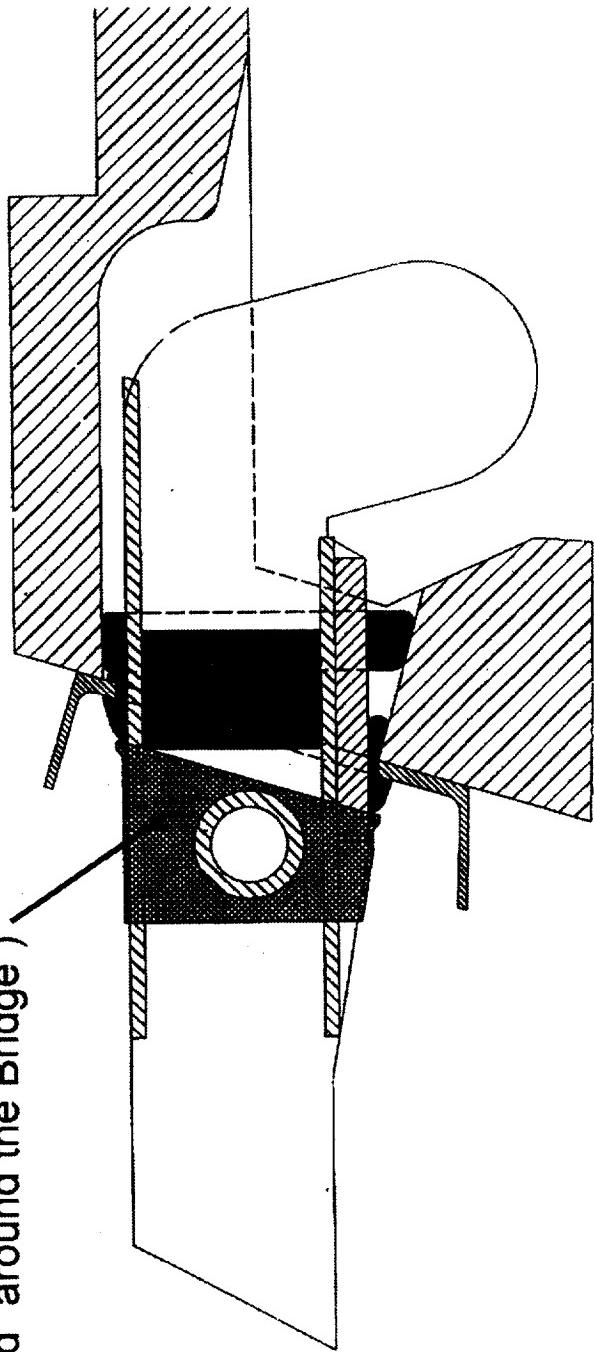
Body Flap - Full Deflection

**Full
Deflection**

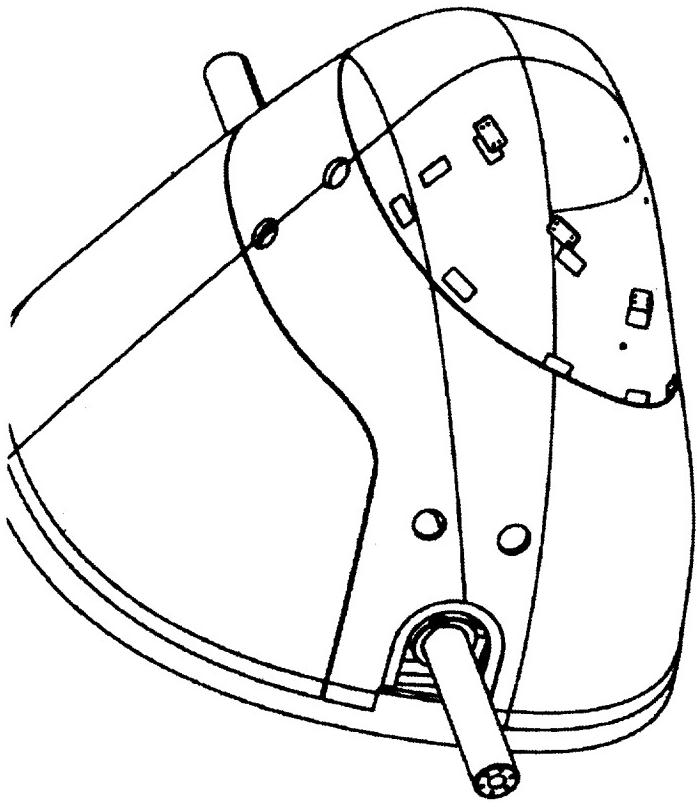


Body Flap Bridge Beam Seal

3M Nextel 440
(wrapped around the Bridge)

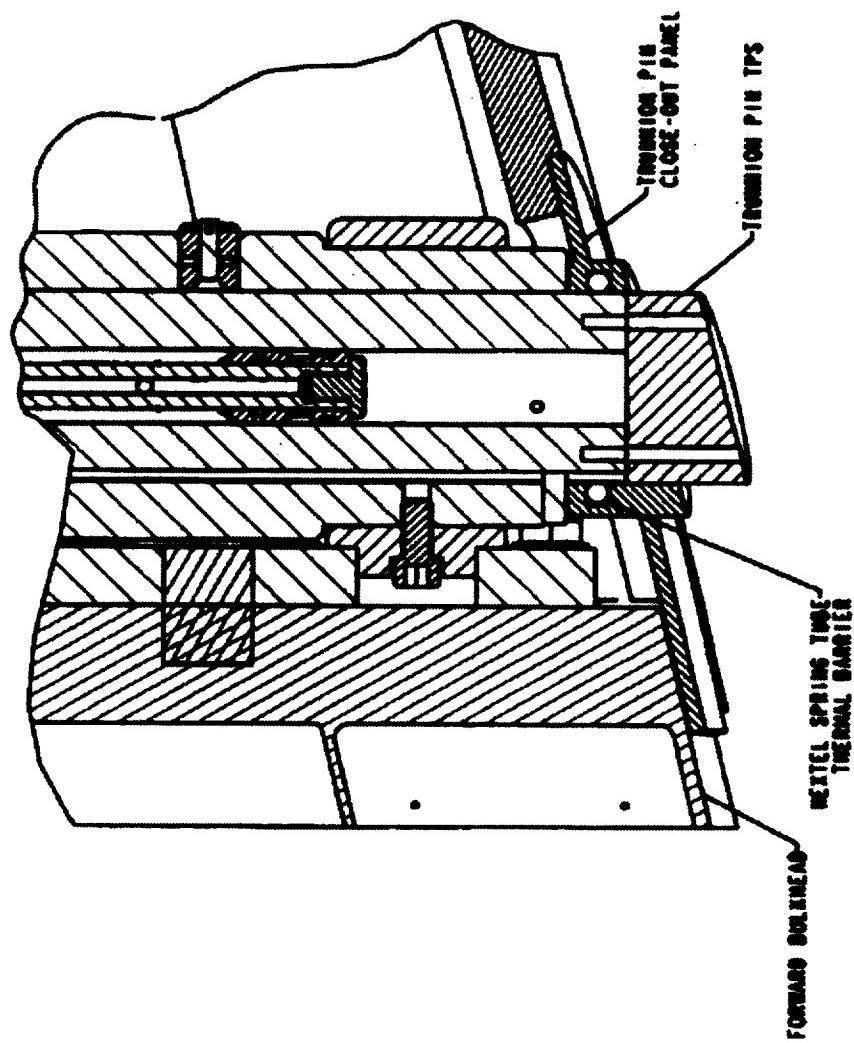


Forward Trunion Pin



Trunion Pin

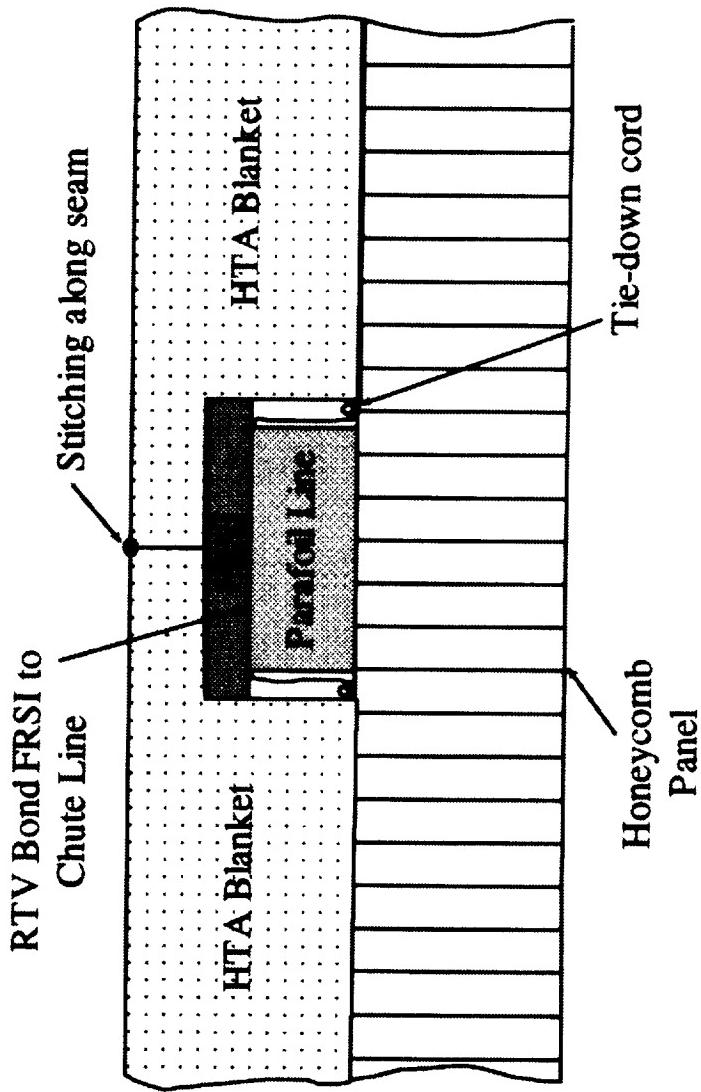
X-38 Forward Trunion Pin Retracted Showing Seal



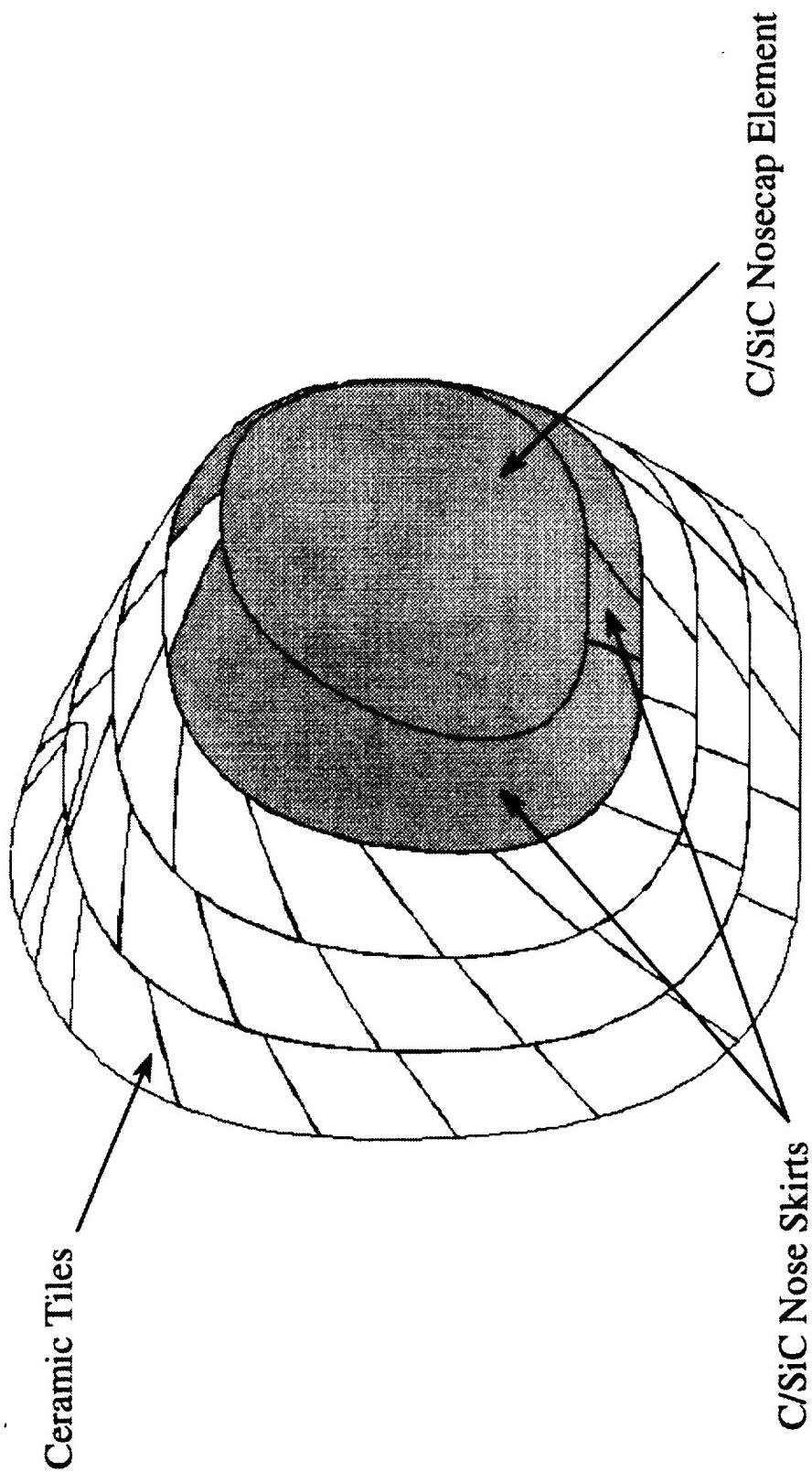
Backup Charts
Showing Additional Seal Locations

Seal Design

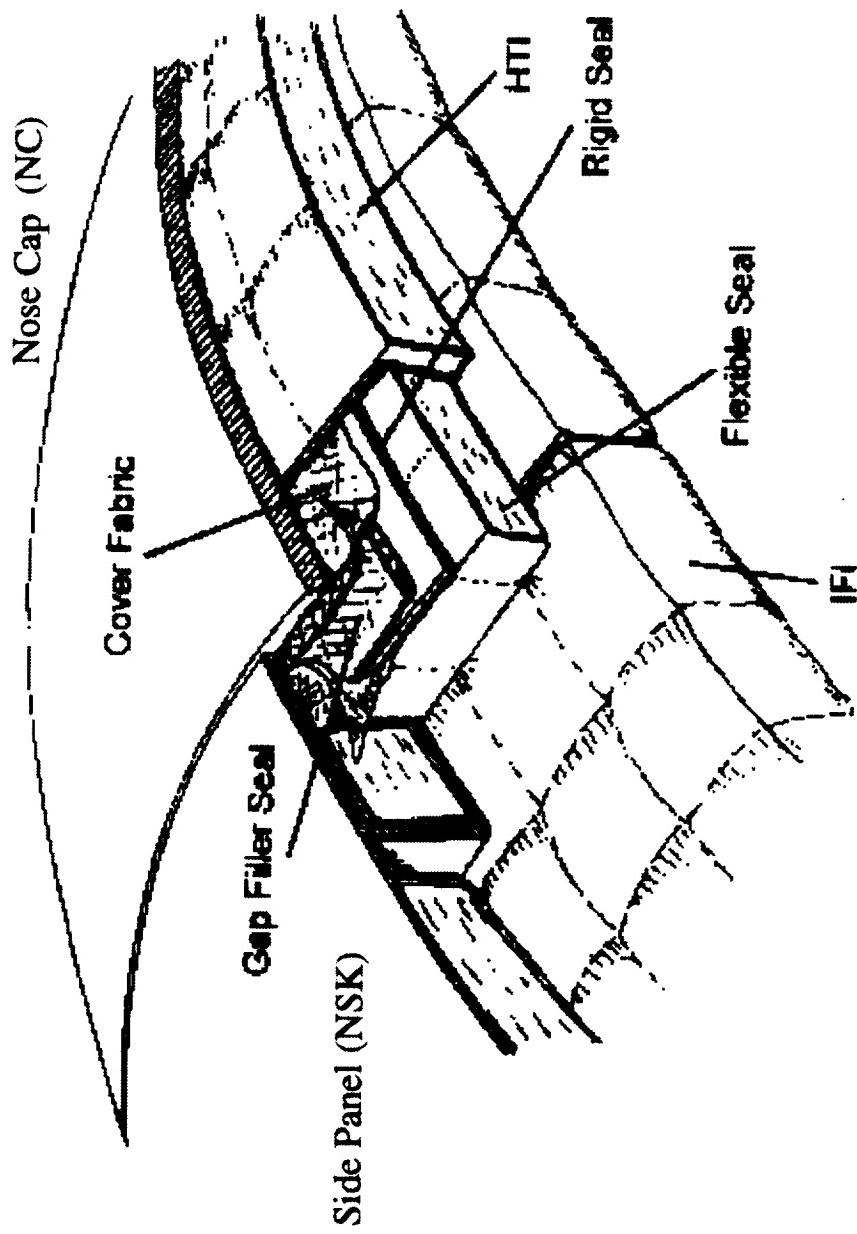
- **Chute line TPS**
 - To protect for blanket failure, a redundant system is incorporated to protect the parachute lines



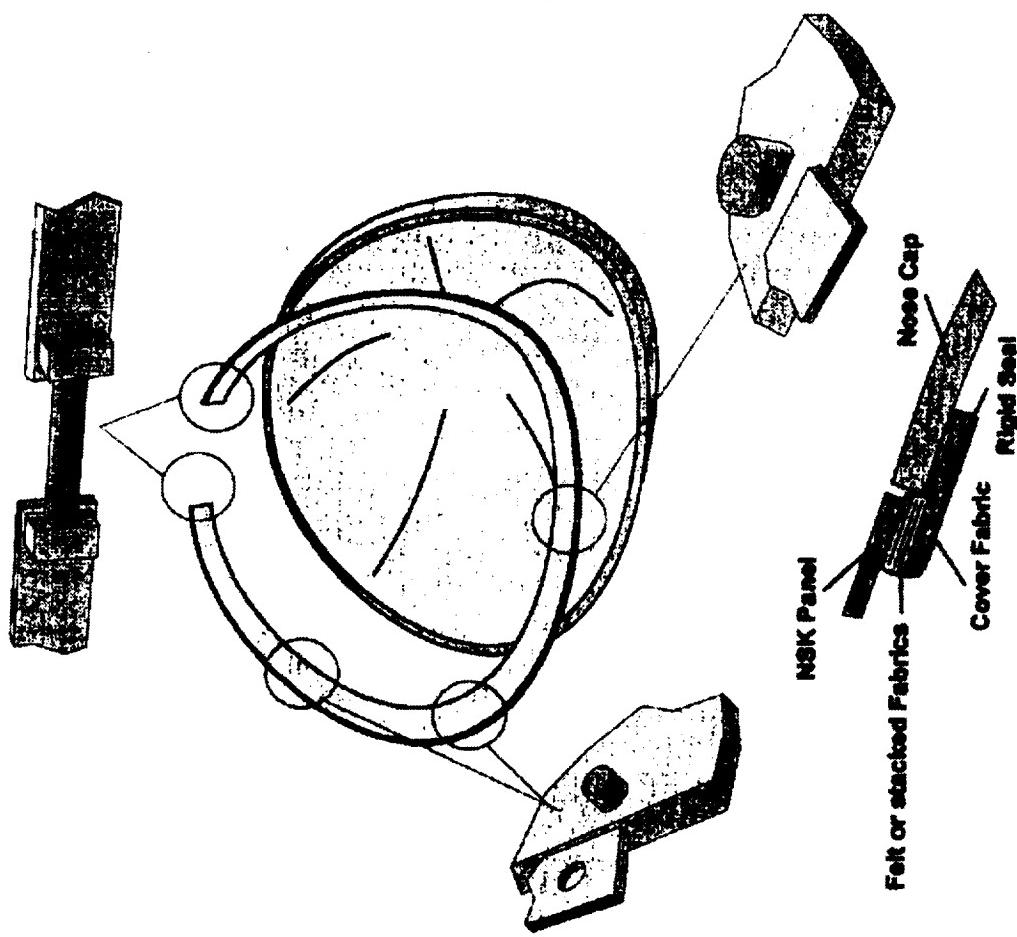
Nosecap TPS



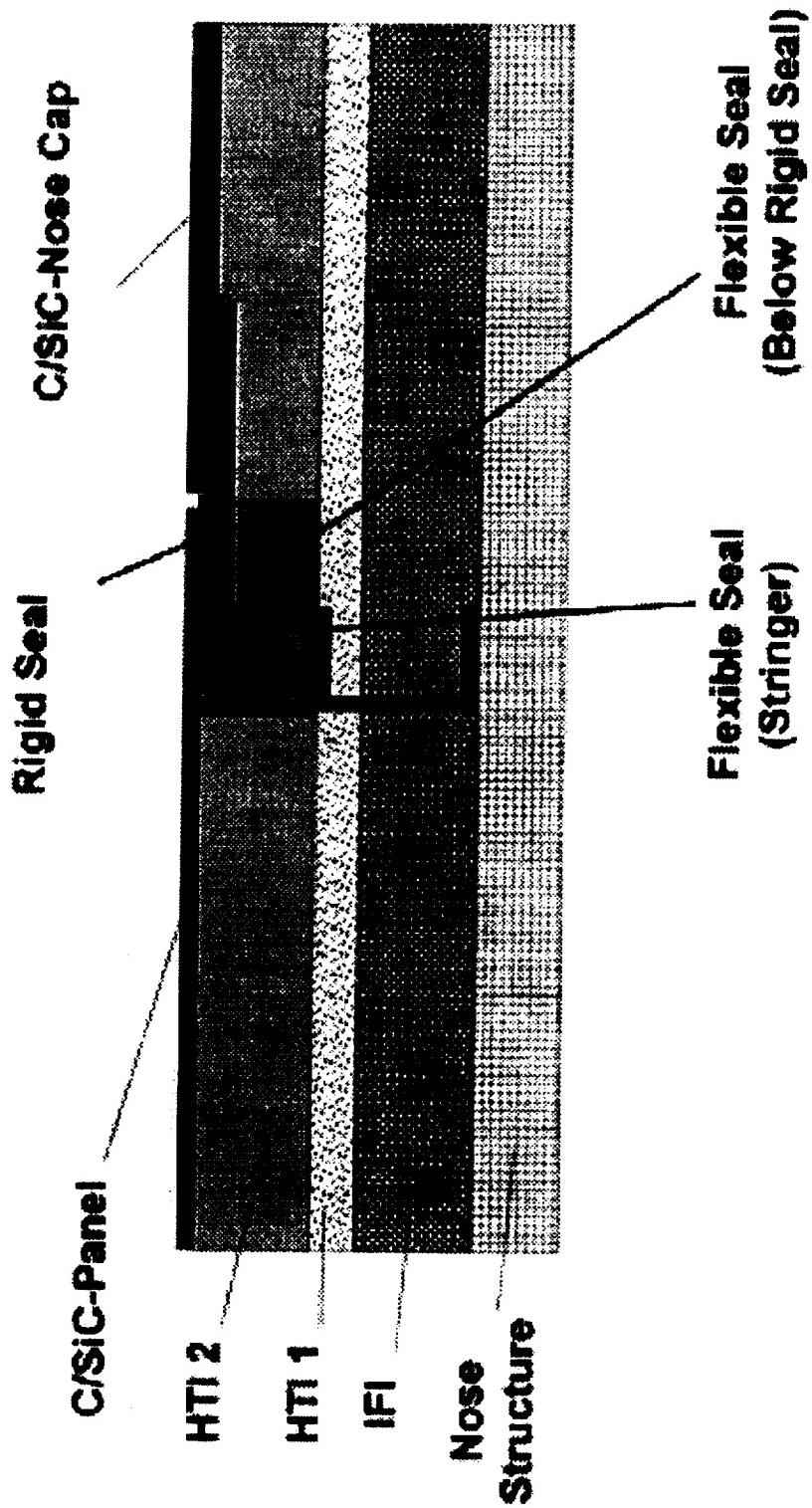
Interface Between Nose Cap and Nose Skirt With Rigid and Flexible Seal



Fixation Concept of the Rigid Seal Between NC and NSK



Chin Panel / Slide Panel



I/F NSK/Thruster Tile

